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CAPABILITY TO ANALYZE NATIONAL TRAINING CENTER DATA

Jack A. Briscoe
The BDM Corporation

for

ARI Field Unit at Presidio of Monterey, California
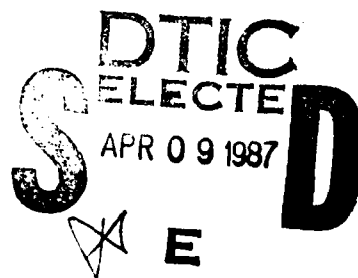James H. Banks, Chief
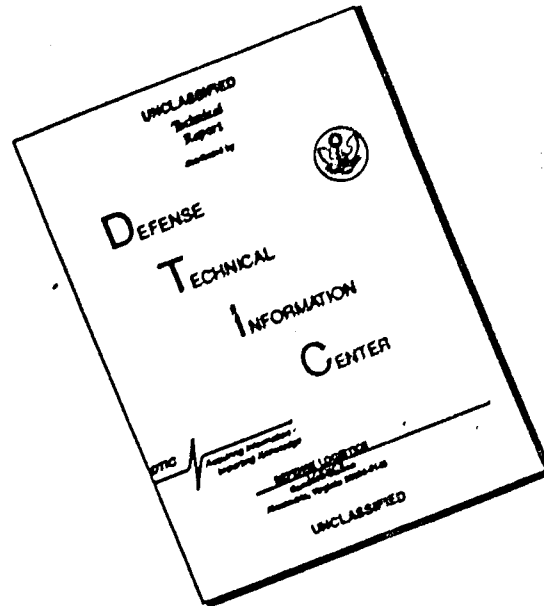
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⸱This report examines the ability (as of October, 1985) of the ARI Field Unit at Presidio of Monterey to use digital data from the National Training Center (NTC) in order to fulfill its mission: research into the training implications of NTC performance.

The report is divided into six sections: 1) a description of the types of digital data available from the NTC, 2) a description of the relevant software capacities of the Field Unit, 3) a resume of the capabilities of the software

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20. Abstract (continued)

tools available at the inception of the current research effort (1 March 1985),
4) a summary of the activities undertaken to improve the Field Unit's ability
to use NTC data, 5) a report on the current status of the Field Unit's
ability to use NTC data to fulfill its objectives, 6) a brief discussion of
short and long range plans to expand the Field Unit's capabilities
   The report focusses on the use of digital data, as opposed to other types of
NTC products which may contribute to meaningful research.

CAPABILITY TO ANALYZE NTC DATA

CONTENTS_____

LIST OF FIGURES

INTRODUCTION

This report documents the current status of the capability of the Army Research Institute. Presidio of Monterey (ARI-POM) to utilize digital data from the National Training Center (NTC) to fulfill its mission of research into training implications of NTC performance.

The report is separated into six sections:

(I) A description of the kinds of digital data available from the NTC.

(II) A description of the relevant software capabilities at ARI-POM.

(III) A resume of the capabilities of the software tools at the inception of the current research efforts (1 March, 1985).

(IV) A summary of the activities undertaken to improve ARI-POM capabilities. relative to the software products discussed in the previous section.

(V) A report on the current status of ARI-POM's capability to use NTC data to fulfill its objectives. and

(VI) A brief discussion of short and long range plans to expand the present capabilities.

This report is focussed on the use of _digital_ data. as opposed to paper. VRS. CCTV. or other NTC products which may contribute to meaningful research.

I. NTC INSTRUMENTED DATA

The NTC Instrumentation System (NTC-IS) supports the collection and retention of data at the National Training Center. The NTC-IS consists of four major subsystems, all of which are involved to some extent in the collection of digital data:

(1) The Range Data Measurement System (RDMS),
(2) The Core Instrumentation Subsystem (CIS),
(3) The Live Fire Subsystem (LFS), and
(4) The Range Monitoring and Communications Subsystem (RMCS)

The RDMS and CIS are the subsystems principally involved in digital data collection. Figure I-1 shows the interrelationships of the relevant components of the RDMS and CIS relating to data collection.

Data collected at the NTC can be divided into three categories:

(1) Raw field data,
(2) Data input manually, and
(3) Data derived from either or both of the prior two categories.

Raw field data are collected by the RDMS; input data are entered via components of the CIS, and data elements are derived by both subsystems.

I.1. Data Collected/ Logged by the RDMS

Raw field data events collected by the RDMS include trigger pull (fire event), laser illumination (pairing), and microphone key pressed/ released. During Live Fire Exercises (LFX) the RDMS also collects target status (up, down, hit). In addition, the RDMS collects raw ranging data from which position/ location is derived for all instrumented players.

The RDMS provides one source of archival data from the NTC. Data elements logged from the RDMS are listed in Figure I-2.

RDMS data are as accurate as the reliability of the collecting/ transmitting hardware allows. The complexity of NTC field instrumentation is conducive to a wide variety of error-producing conditions, including:

(1) Spurious RF transmissions, leading to erroneous events,
(2) "Noisy" laser sensors which generate spurious and/or inaccurate pairing events;
(3) Hardware/electronic player instrumentation problems leading to loss or duplication of valid events, and the generation of invalid events; and
(4) Coverage problems resulting in the loss of track of instrumented vehicles and the corresponding loss of position/ location and event retrieval capability.

Even in the case of perfect hardware performance, it is possible for errors to be introduced by faulty initialization. If the proper B-unit code is not associated with the right player identification, incoming events will be improperly assigned or may be deleted as invalid. Such problems can quickly lead to a serious loss of data integrity.
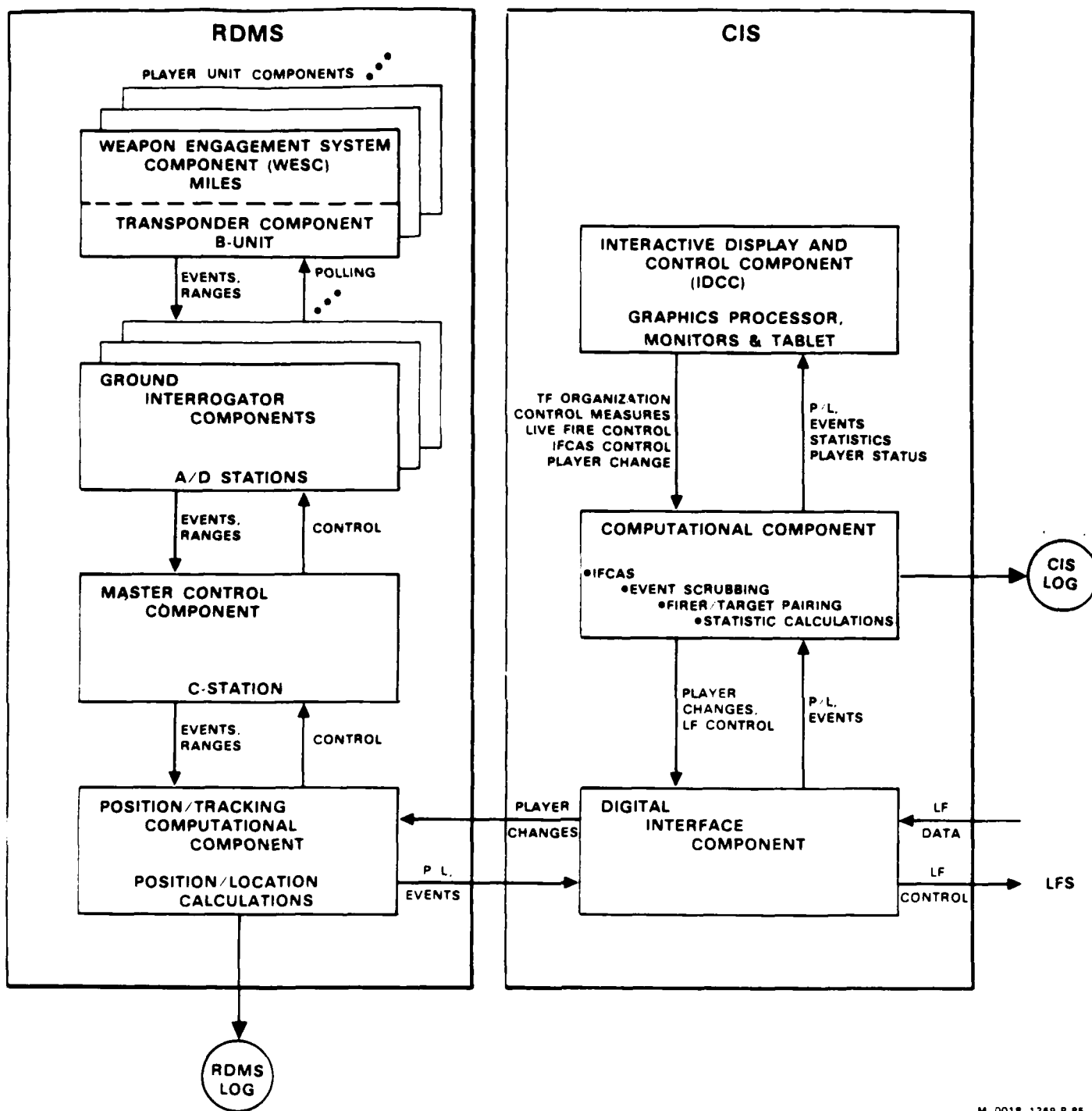
Figure I-1

NTCIS Subsystems

DATA ELEMENT	DESCRIPTION
Trigger Pull	Event received when a shot is fired by an instrumented weapon system. Event data consist of firer player number and weapon type.
Ammunition Remaining	Pair of events received immediately following trigger pull. Tens digit in former message, units in latter.
Laser Illumination	Event sent by target (player being lased.) This event type is one of three different kinds of codes, for HIT, NEAR MISS, and KILL. For a HIT message, event indicates general type of weapon. For NEAR MISS and KILL, more exact weapon type information is included.
Communication	An event is sent by a player whenever the microphone key for either net is depressed or released. The message includes the net (1 or 2) and the action (depress = on, release = off).
Live Fire	There are four Live Fire events passed from the targets via RDMS. They are: target UP, target DOWN, HIT by ballistic projectile, and HIT by Laser.
Position/Location	The Position/Location of each instrumented player is derived by RDMS software from raw Range Data and logged.
Player Status	Player Status initialization and updates, which are entered from the CIS and transmitted to the RDMS are also logged. These data include the B-Unit Player identification/weapon system assignment.

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Figure I-2

Data Elements Logged by the RDMS

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I.2 Data Collected/ Logged by the CIS

The CIS performs several functions related to the collection/ generation of NTC digital data:

(1) The interactive Display and Control Component (IDCC) provides the interface between Experiment Monitoring and Control (EMC) and Training Analysis and Feedback (TAF) personnel and the ongoing exercise(s).

(2) The CIS/IDCC also supports pre-exercise initialization which includes entry of:

      (a) Player initialization information,
      (b) Control measure information,
      (c) Task Force organization,
      (d) Live Fire scenarios, and
      (e) Pre-planned artillery.

(3) The IDCC provides real-time control of the Live Fire Exercises (LFX) by the Live Fire Control Officer (LFCO).

(4) The CIS Computational Component is used to pair firers with targets for real-time engagement simulation.

(5) The CIS provides computing capacity for real-time data manipulation, such as the calculation of statistical measures and unit roll-up totals.

(6) The CIS logs data in real-time to provide the primary archival source of NTC data.

Figure I-3 lists NTC data logged by the CIS, noting data elements that are logged by both the RDMS and the CIS. It should be noted that many of the elements logged from the CIS are manually input data elements. Reliability of manual data depends upon the accuracy of the personnel entering the data and the verification procedures that are employed, such as proofreading and consistency checks.

DATA ELEMENT	DESCRIPTION
Background/Documentation	History and segment name, start and end times, mission type, exercise conditions, task force and OPFOR organizations.
Unit/Player Status info	Status of individual players and/or units, including: Instrumented/Not Instrumented Tracked/Not Tracked Position/Location
Fire Event (RDMS trigger pull)	Event generated when a shot is fired by an instrumented weapon system. Should be identical with RDMS log, with the exception of the deletion of invalid events
Pairing (RDMS pairing except as noted)	Event (HIT, NEAR MISS, or KILL) generated when the laser sensors of an Instrumented Target System are illuminated and decoded into a valid message. If possible, target is paired with a firer. If unpaired, firing weapon type is discarded.
Control Measures	Locations for control measures entered from IDCC. Message can include control measures added or deleted. Mines are included in this category.
Indirect Fire Casualty Assessment (IFCAS)	Fire Mission Number, assessment of number of casualties inflicted.
Call Fire Missions	Call for previously planned Indirect Fire (artillery, mortars).
Commo	Player Identification, Radio Net, and duration of Commo messages longer than 55 seconds, should agree with RDMS log for those messages, but all others are lost.

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Figure I-3

Data Elements Logged by the CIS

II. ARI-POM SOFTWARE

Processing of NTC data at ARI-POM varies according to the data source. CIS-logged data may be processed in two ways:

(1) Review on NTC IDCC workstations, or

(2) Processing via the NTC Database Research System (NTCDRS) to translate the binary data into an ASCII (man readable) format and load the data into databases which can be manipulated by a commercial relational database system.

Figure II-1 is a simplified diagram of the processing options for CIS log data.

Upon receipt of CIS log tapes for each NTC rotation, each mission segment is reviewed on a workstation, and the following information is collected and recorded:

(1) Mission segment name, sequence number, and identifier;

(2) Mission type;

(3) Start time, end time, and duration; and

(4) Number of main gun firings and engagements for both the task force and the OPFOR.

These data are retained in an INGRES database from which a complete catalog of CIS log data may be generated. Figure II-2 is a sample of one kind of report produced from this data base.

Processing of RDMS log data is by program GDETAP, which was developed at ARI-POM.

II.1 NTC Workstation Software

ARI-POM possesses two workstations identical to those which are part of the Interactive Display and Communications Component (IDCC) at the NTC. The workstations can be used in Historian mode to review any mission for which the data (CIS log) are available. All historian mode functions are functional. Engagement simulations can be examined in detail, using the full repertoire of map options, scaling, player/unit symbol display options, control measures, and summary statistics.

II.2 NTC Database Research System (NTCDRS)

The NTC Database Research System was developed by Science Applications Incorporated (SAI) under contract to ARI-POM to provide basic capability, via the INGRES relational database manager, to do research on archived NTC data. NTCDRS is written in FORTRAN and operates on the ARI-POM VAX 11/780 computer system.

NTCDRS consists of three processing steps, to TRANSLATE the binary CIS log file data to ASCII, to create an INGRES database and compatible files, and to LOAD the INGRES tables with NTC data. Figure II-3 is an annotated diagram of the NTCDRS processing steps.

The TRANSLATE step consolidates and converts the binary CIS log files for one mission segment to one file in an ASCII format. The TRANSLATE program provides the user with three options:

(1) Translate statistical data,

(2) Translate position/location data, and/or

(3) Translate AAR data.

NTC History Data Tapes for
One Rotation/Task Force

Dec Backup
Utility

Restore Files From Mag
Tape to Disk

VAX
Disk

NTC CIS Log Files:
4 at Task Force/Rotation Level
10 Addtional per Mission segment

NTC
Database
Research
System

NTC
Workstation

o Convert Files
  to INGRES Tables

o Review Mission
  Segment
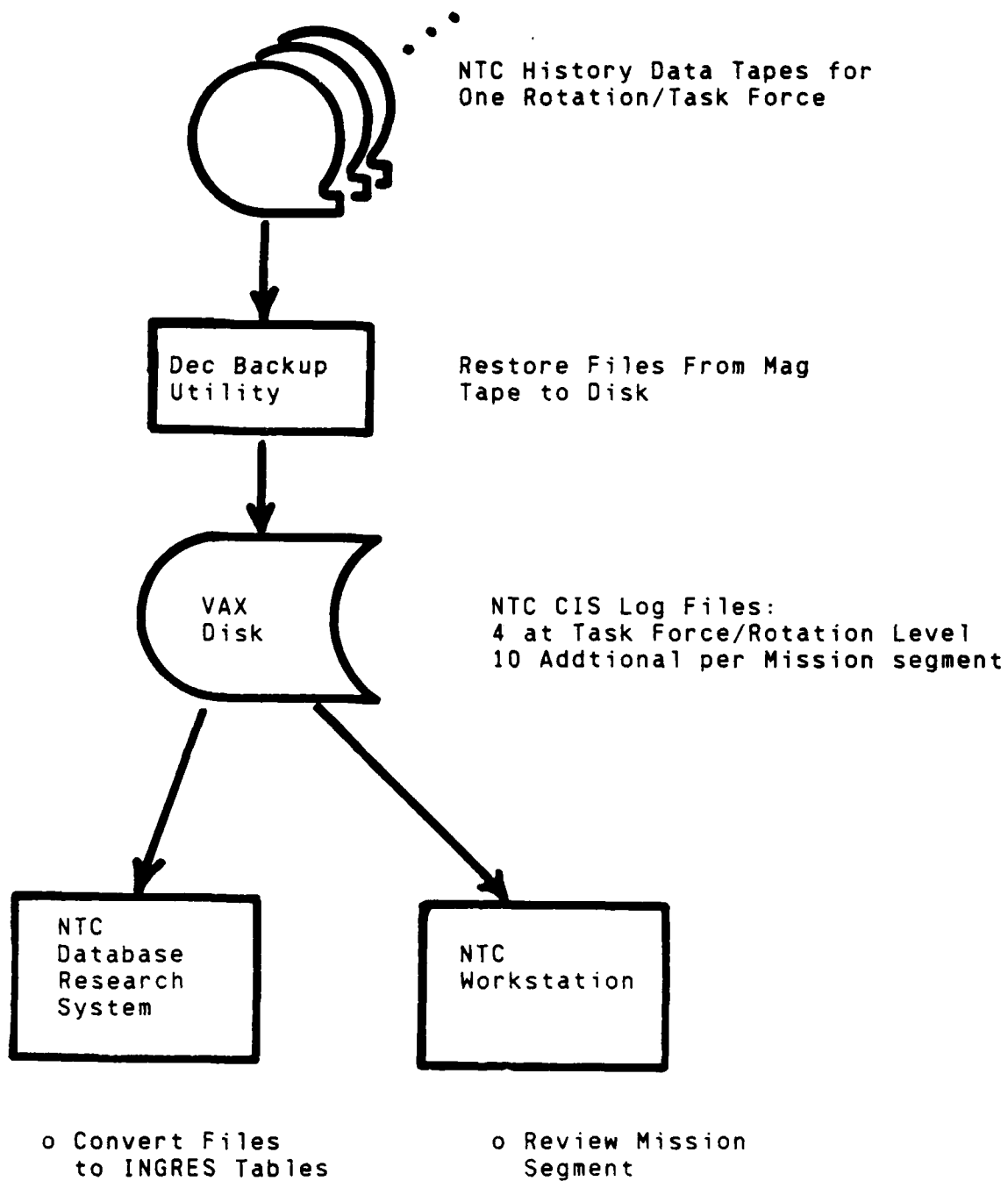
Figure II-1

CIS Log Processing Options

Summary History Segment Report

Exercise	Segment	Mission	Unit Code	Bl Mngun	Rd Mngun	Start Date	Duration
8513AO	1	START SE	1-040	411	179	14-aug-1985	15:40 hours
	2	CON ATT	1-040	148	43	16-aug-1985	15:20 hours
	3	RECON RE	1-040	6	0	17-aug-1985	02:10 hours
	4	DEF IN S	1-040	372	127	17-aug-1985	14:40 hours
	5		1-040	0	0	18-aug-1985	09:45 hours
	6	LFX MTC	1-040	161	0	20-aug-1985	06:15 hours
	7	DEFBPLFX	1-040	95	0	21-aug-1985	05:15 hours
	8	LFXN/DEF	1-040	0	0	22-aug-1985	01:05 hours
	9	LFX/NDEF	1-040	7	0	22-aug-1985	00:20 hours
	10	FTEST	1-040	0	0	20-aug-1985	48:15 hours
	11	LFXC/ATK	1-040	74	0	22-aug-1985	07:00 hours
	12	LFXSECTO	1-040	0	0	23-aug-1985	00:20 hours
	13	PASSAGE	1-040	0	0	23-aug-1985	00:25 hours
	14	PASSAGE	1-040	0	0	24-aug-1985	00:10 hours
	15	DEF BP	1-040	4	0	24-aug-1985	01:00 hours
	16	DEF BP	1-040	0	0	24-aug-1985	00:35 hours
	17	DEF BP 3	1-040	0	2	24-aug-1985	00:35 hours
	18	DEF4	1-040	45	0	24-aug-1985	01:55 hours
	19		1-040	525	348	25-aug-1985	08:30 hours
	20		1-040	0	0	25-aug-1985	02:55 hours
	21	MTC	1-040	225	140	26-aug-1985	10:05 hours
	22	BRIEF	1-040	96	0	26-aug-1985	04:05 hours
	23	D ATT 1	1-040	0	0	26-aug-1985	01:30 hours
8513MO	1	LFTEST	3-156	0	0	14-aug-1985	00:40 hours
	2	RD MARCH	3-156	0	0	14-aug-1985	03:25 hours
	3	D ATK	3-156	78	24	15-aug-1985	06:25 hours
	4	RECON-1	3-156	0	0	16-aug-1985	02:35 hours
	5	D ATK	3-156	102	93	16-aug-1985	05:15 hours
	6	S ATK	3-156	238	109	17-aug-1985	07:10 hours
	7	RD MRH	3-156	1	0	17-aug-1985	05:25 hours
	8	DEF BP	3-156	0	0	18-aug-1985	00:01 hours
	9	OP/LP	3-156	0	0	18-aug-1985	00:01 hours
	10	OP/LP 2	3-156	13	0	18-aug-1985	08:20 hours
	11	SPOILIN	3-156	162	5	19-aug-1985	05:10 hours
	12	EOM	3-156	5	0	19-aug-1985	02:10 hours
	13	OPFOR RE	3-156	44	31	19-aug-1985	07:30 hours
	14	DEF BP	3-156	214	119	20-aug-1985	04:20 hours
	15	REC DEFS	3-156	2	0	20-aug-1985	07:30 hours
	16	RECON	3-156	357	319	21-aug-1985	12:40 hours
	17	TF RECON	3-156	0	0	23-aug-1985	01:35 hours
	18	MTC	3-156	101	0	23-aug-1985	06:15 hours
	19	ROAD MAR	3-156	0	0	23-aug-1985	05:40 hours
	20	ZERO 1	3-156	44	0	24-aug-1985	05:10 hours
	21	LF TEST	3-156	0	0	25-aug-1985	01:55 hours
	22	BRIEF	3-156	0	0	25-aug-1985	01:35 hours
	23	BRIEF 2	3-156	25	0	26-aug-1985	07:20 hours
	24	LFX DAY	3-156	221	0	26-aug-1985	03:45 hours
	25	EOM	3-156	3	0	26-aug-1985	01:10 hours
	26	DEF BP N	3-156	0	0	26-aug-1985	00:55 hours
	27	LFX NIT	3-156	193	0	26-aug-1985	03:10 hours
	28	EOM	3-156	0	0	26-aug-1985	00:55 hours
	29	C ATK	3-156	285	0	27-aug-1985	32:50 hours
	30	AAR	3-156	0	0	27-aug-1985	00:15 hours

Figure II-2
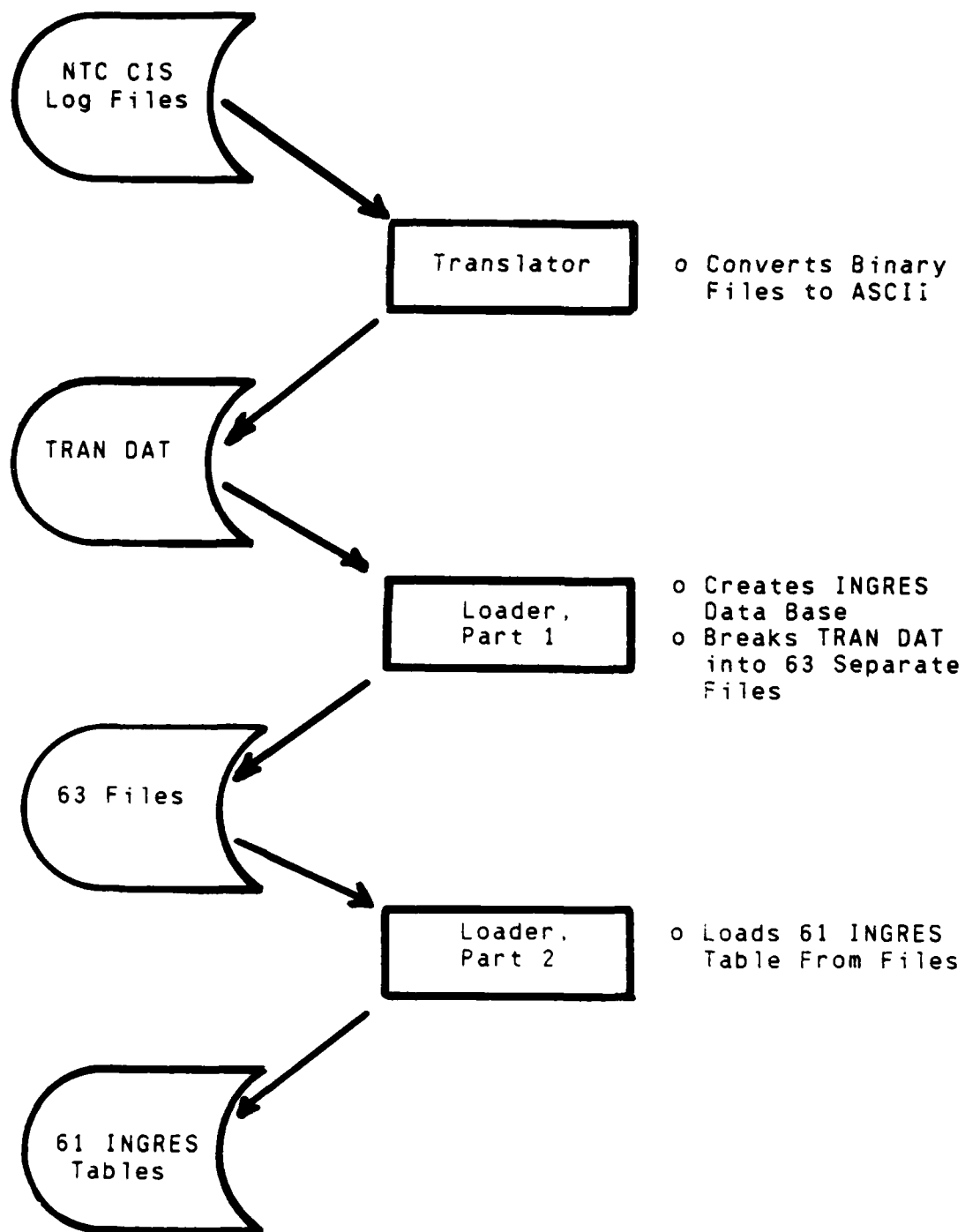
Sample catalog Report

Figure II-3

NTCDRS Processing Flow

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These options may be selected independently of one another to translate any combination of NTC data for a mission. Another option allows the user to select the start and end times of the period to be translated. The options selected during the translate step control which data are passed to subsequent NTCDRS processing steps.

The second NTCDRS step interfaces with INGRES to create a skeleton INGRES database for the mission segment, and to break the ASCII file written in the TRANSLATE step into 63 separate files, each in INGRES compatible format.

Third NTCDRS step loads 61 INGRES database tables from the 63 files created during step 2. Figure II-4 shows the correspondence between the files written in step 2 and the 61 tables filled in step 3.

The result of the NTCDRS is an INGRES database for each mission segment processed.

II.3 Program GDETAP

Processing of the RDMS log tapes is accomplished by using the ARI-POM developed program GDETAP, which reads RDMS log tapes and creates three different reports:

(1) Event lists, including firing and pairing data,

(2) Commo report including the duration is seconds of each radio transmission, and

(3) Player report, which shows the correspondence between player numbers and transponders.

Various VAX utilities can be used to sort and edit the basic reports to yield a variety of documents.

A complete description of program GDETAP is contained in the ARI document Program GDETAP Documentation, September, 1985.

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INGRES table name vs. LOADER file name table

Table Name	File Name	Order		Table Name	File Name	Order
SEGMENTDATA	SEGDAT. HLD	1		EQUIPSTATUS	EQPSTA HLD	33
SEGHEADER	SEGHEA. HLD	2		CPUSTATUS	CPUSTA HLD	34
MISSIONS	MISSIO. HLD	3		UNVEHSTATUS	UNVSTA HLD	35
SEGSUMRATING	SEGSUM. HLD	4		TRACKINGSTAT	TRASTA HLD	36
PLSTATVECTOR	PLSTAT. HLD	5		LFSCENARIO	LFSCEN HLD	37
PLSTATVECTOR	PLYRAD. HLD	6		LFTARGETEVNT	LFTAEV HLD	38
PLYREDIT	PLYRED. HLD	7		LFTARGETSTAT	LFTAST HLD	39
PLYRCHANGE	PLYRCH. HLD	8		TGTHOLVECTOR	TGTHLV HLD	40
PLYRINSTSTAT	PLYRIN. HLD	9		PERCASLTYSUM	PERCAS HLD	41
PLYRREDESIG	PLYRRE. HLD	10		PERCASLTYSUM	CASLOG HLD	42
PLYRLOC	PLYRLO. HLD	11		MINFLDCASLOG	MNCASL HLD	43
UNITSTATEVT	UNITST. HLD	12		MINEFIELDCAS	MNCAST HLD	44
UNITEDIT	UNITED. HLD	13		UNITMOVEMENT	UNMOVE HLD	45
UNITREDESIG	UNITRE. HLD	14		UNITTRANS	UNTRAN HLD	46
UNITLOC	UNITLO. HLD	15		ENGRNGSUM	ENGRNG HLD	47
MIXEDUNIT	MXUNIT. HLD	16		FIRPAIRING	FIRPAR HLD	48
UNITENGMSG	UNITMG. HLD	17		VPRDRENGAG	VPRDRG HLD	49
UNITENGAGE	UNITEN. HLD	18		OTHERWEAPON	OTHWEA HLD	50
IFCASTARGET	IFCAST. HLD	19		FREEFORMMSG	FREMSG HLD	51
IFCASCASULTY	IFCASC. HLD	20		MSGCATEGORY	MSGCAT HLD	52
FIRESUPLOG	FIRESU. HLD	21		OCASSESSMENT	OCASMT HLD	53
CASUALTIES	CASULT. HLD	22		OCINFOELEMNT	OCELMT HLD	54
IFCASALERT	IFCASA. HLD	23		AARCOMMANDS	AARCOM. HLD	55
IFPREPLANTAR	IFPREP. HLD	24		MAPBUTTONS	MAPBUT. HLD	56
IFTARGROUP	IFTARG. HLD	25		BLFORBUTTONS	BLFORB HLD	57
CONMESVECTOR	CMVECT. HLD	26		ALERTBUTTONS	ALERTB HLD	58
CMDELETE	CMDELT. HLD	27		OPFORBUTTONS	OPFORB. HLD	59
CMLOCATION	CMLOCA. HLD	28		RANGEFANS	RNGFAN HLD	60
CONMESTACCAT	CMTACT. HLD	29		LFBUTTONS	LFBUTT HLD	61
FIRING	FIRING HLD	30		OTHERBUTTONS	OTHBUT HLD	62
PAIRING	PAIRIN. HLD	31		COORDINATES	COORDS HLD	63
COMMO	COMMOM. HLD	32				

Figure II-4

INGRES Tables VS. Loader File Names

III. STATUS OF ARI-POM SOFTWARE AS OF MARCH, 1985

This section documents the status of ARI-POM software at the time the present research program started. It documents the status of software in two areas, NTC workstations and the NTCDRS.

III.1 NTC Workstation Software

NTC workstation software was fully operational at the inception of the current effort.

III.2 NTC Database Research System

As of March, 1985, several problems existed with operation of the NTCDRS, including:

(1) There were inadequate operating instructions for the command files furnished by the contractor;

(2) The system was incapable of processing multiple mission segments;

(3) The system was prone to fail catastrophically during the LOADER step; and

(4) In certain mission segments, non-ASCII characters were introduced during the TRANSLATOR step.

When it worked, the software appeared to work generally as promised once the operational difficulties could be overcome. The operational difficulties appeared to result from having adapted command procedures from another location, as opposed to creating new ones tailored to the ARI-POM environment.

A secondary effort was directed to examine the utility of the output from the NTCDRS, the INGRES tables. The results of that effort are included as Appendix A of this report.

IV. CORRECTIVE/DEVELOPMENTAL ACTIVITIES

This section discusses the completed activities that were undertaken either to correct deficiencies in the NTCDRS operating environment or to add new capabilities.

IV.1 NIC Database Research System

Changes to the NTCDRS fall into three categories:
(1) Development of operating procedures. including command files. disk allocation strategies. and naming conventions.
(2) Development of "work arounds" to avoid problems encountered in NTCDRS software. and
(3) Modifications to NTCDRS software.
New operating procedures have been established which will enable the NTCDRS to be used in a production environment. These operating procedures generally take the form of DEC COMMAND files which allow use of NTCDRS programs in a more user-friendly manner. The command files remove the burden of routine activities from the user by guiding him. via on-screen prompts. through the TRANSLATE and LOAD processes. The command files ensure that ARI-established naming and disk storage conventions are followed. The command files also accomodate any "work arounds" that have to be used. Two command files are routinely used for the NTCDRS. TRANSLATE and LOAD.
Solutions to data problems within NTCDRS operations have been solved in several ways:
(1) By developing a "filter" program to correct ASCII characters.
(2) By editing intermediate files. either manually or automatically. or
(3) By avoiding the use of TRANSLATOR options which lead to fatal errors.
The filter program was developed to solve a specific problem that was created by the TRANSLATOR program. In certain cases the TRANSLATOR writes the word "FIREE" instead of "FIRER". which causes a subsequent problem in the LOADER program. The filter program simply corrects the problem between the two steps by reading the output file from the TRANSLATOR (TRAN.DAT). changing FIREE to FIRER. and writing a new TRAN.DAT file.
From time to time. other problems manifest themselves. by the appearance of spurious characters or by the failure of one of the LOADER steps. The problems can sometimes be identified as a result of garbled TRANSLATOR or LOADER output data. In many cases. the errors are in fields that are not critical. so that simple substitution of dummy data will allow processing to progress. For example. one recurring problem was the appearance of ASCII zeros in the intermediate file used to build the PAIRING table. This caused the LOADER to abort during the loading process. It was discovered that a simple string substitution would allow the process to end while preserving all valid data. This fix was proceduralized so that it can be invoked by a simple command procedure call whenever needed. Other problems can be fixed as they occur. by using system text editing capabilities.

The third way to bypass NTCDRS errors is to avoid the processing which causes the error. For example, certain mission segments abort if the AAR option is selected for the TRANSLATOR step, but if only the STAT option is selected no error occurs. Because the AAR tables have not been required in research efforts heretofor, this is a workable solution. Likewise, translating position/ location data takes a tremendous amount of time, so the PL option is selected infrequently, even though no errors have occurred during PL translation.

Thus far, modifications to NTCDRS software have been minor, changes to make the programs compatible with the revised operating procedures, and fixes to three "bugs" which showed up as a result of the new command files. Some software has been developed using NTCDRS subroutines to add more flexibility to operations.

V. CURRENT STATUS

This section documents the current status of NTC data
processing capabilites. It is divided into three sections, for
NTC workstation operation, for the NTCDRS, and for program GDETAP.

V.1 NTC Workstation Operation

NTC workstations are fully operational to the level of those
at the NTC.

V.2 NTC Database Research System

The NTCDRS is operational to a limited extent. Routine
production of CIS log data through the NTCDRS is limited by
intermittent problems which cause the TRANSLATOR or LOADER
programs to halt. These situations require intervention by a
senior analyst, to identify the source of the problem and devise a
solution. In cases where no solution is obvious, the error is
documented and processing of the mission segment is abandoned. If
the error can be traced to a TRANSLATOR option (i.e. AAR), the
program is rerun without choosing that option. As described in
section IV, several errors occur frequently enough to have
justified the creation of special software or command files to
allow processing to continue. Use of the position/ location
option has generally been avoided because of the excessive
execution time required.

V.3 Program GDETAP

Program GDETAP meets current operating requirements. Rotation
85-10 has been fully processed by GDETAP, and these data are being
used to assess data consistency between the two digital sources,
the CIS log and the RDMS log. The results of this effort will be
the subject of a subsequent report.

VI. PLANS

Near-term (ᵓ months) planning for ARI-POM digital data
processing is focussed on operational issues, whlie mid- to long-
range plans are concerned with the areas of database design and
software development.

Operational goals for the near term include:

(1) Implementation of routine NTCDRS processing of data tapes
as they are received at ARI-POM. As discussed in section IV,
NTCDRS is in a near operational condition, awaiting only the
solution of the outstanding software problems, the implementation
of standard procedures, and additional staffing to allow routine
production

(2) Establishment of standard INGRES queries tailored to the
present database structure. This will allow researchers to create
"standard" reports and/or files.

(3) Development of methodology to allow direct comparison/
combination of CIS and RDMS log data sources. This will enable
researchers to fill some "gaps" in CIS data by using data from the
RDMS log. In addition, certain data which may be required for
research are present only on RDMS log tapes.

Mid-range (6 months to 1 year) plans concern database
redesign, software design/ development, and the acquisition of
additional data from NTC:

(1) Redesign of INGRES database to more sufficiently support
ARI-POM research efforts. The current design is inconvenient to
use, is massively redundant, and contains superfluous data. The
redesign will bring the structure and format of the NTC database
in line with ARI-POM research objectives.

(2) Design/ development of software to convert present INGRES
databases to new form and translate/load data directly to new
database format. Conversion of databases created by the present
NTCDRS should be possible by using INGRES capabilities. it is
expected that the TRANSLATOR program of the NTCDRS will be
adequate to support the redesigned database, but the LOADER
functions will have to be redesigned.

(3) Development of new translation/ loading software to more
efficiently handle processing of position/ location data. At
present, NTCDRS processing of position/ location data is roughly
equivalent to real-time (one hour of PL data in one hour of
computer time). This is clearly exorbitant.

(4) Specification of additional data required from the NTC to
support ARI-POM research programs. As ARI research continues and
familiarity with NTC operations grows, it is anticipated that data
elements will be identified which either are or can be collected
at the NTC and are vital to ARI research. These elements will be
identified as quickly as possible so that their collection/
retention can be arranged.

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APPENDIX A - INGRES TABLES

Analysis of Ingres Tables

This section of the report provides a description and analysis of the Ingres tables which comprise the NTC digital data base. The discussion has been organized into three parts: the initial part describes the creation of the tables and presents a short description of them, the second section provides an analysis of the content of the tables in terms of their completeness, function and research utility; the last section contains the results of an investigation of the reliability and consistency of selected table elements.

Creation and Description of Ingres Tables

As discussed in the previous sections of this report, the digital data from NTC are submitted to a multistep process, the NTCDRS in order to be used at ARI-POM. This process results in the translation and loading of the orginial NTC digital data into a set of ingres tables. Specifically, sixty-one tables are created for each translated history segment from an NTC rotation. The amount of information and the function of these tables varies considerably across tables and segments. A brief description of each of these tables is presented below.

INGRES TABLE NAME	DEFINITION
SEGMENTDATA-	This table acts as an index to all the remaining INGRES table data. by relating field times to a specific history and segment.
SEGHEADER-	This table defines segment description information which is defined by the CIS operator at the start of a segment via the Exercise Segment Definition interactive menu. The validity of the data contained in this table is dependent upon the operational procedures being followed at NTC. Currently the data provided by the operators does not always reflect the actual situation which occurred during the exercise.
MISSIONS-	This table defines any company missions which might be defined for an exercise segment.
PLYREDIT-	This table includes certain update information which is generated by the NTC software. Most fields contained in the table do not differ from those found in the Plstatvector table: however. certain fields. such as the COM indicator updates. are defined only in this message.
PLSTATVECTOR-	This table indicates the players who have been defined in a translated exercise segment. Player types include instrumented players and uninstrumented players. Instrumented players in NTC represent the equipment or personnel in the field equipped with B-units for which position and event data can be collected. Uninstrumented players may be defined for notional players. equipment. or personnel without B-units and represent players in the exercise which are not instrumented for position and events. CIS operators must manually enter positon location data for uninstrumented players. The data for this table are derived from the Player State Vector Table and the stream data messages which define players created following initialization.
PLYRCHANGE-	This table includes all stream data messages which define the Player Status.

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PLYRINSTSTAT-   This table includes all stream data
                      messages which redefine the instrumentation
                      status of a player. The instrumentation
                      status of a player may be changed by the
                      CIS operator via the Player/Unit ID menu.

PLYRREDESIG-   This table includes all stream data
                      messages which redefine a player's task
                      organization. The task organization of a
                      player may be changed by the CIS operator
                      via the Task Organization menu.

UNITEDIT-   The unit edit table provides information
                      which changes the values of the information
                      contained in the UNITSTATEVT table.

UNITSTATEVT-   This table defines the units defined for an
                      exercise, including both those defined at
                      initialization as well as those added to
                      the system by the CIS operator via the
                      Player/Unit ID interactive menu.

UNITREDESIG-   This table defines the stream data messages
                      which are used to update a unit's task
                      organization. The CIS operator updates the
                      task organization of a unit via the Task
                      Organization interactive menu.

PERCASLTYSUM-   This table contains information which is
                      entered by the CIS operator to update the
                      current status of personnel strength and
                      losses on the battlefield. All data are
                      operator entered through the Initial
                      Personnel Strength - Next Exercise Segment
                      and Personnel Status interactive menus and
                      is intended to reflect casualty information
                      for uninstrumented personnel. The data
                      contained in this table is used in the
                      generation of Personnel Status - Units
                      statistical display.

UNVEHSTATUS-   This table includes the vehicle status
                      information provided by the operator
                      through use of the Initial Vehicle Strength
                      - Next Exercise Segment interactive menu as
                      well as the vehicle status information
                      which is logged during the segment through
                      use of the Vehicle Status interactive menu.
                      Vehicle status information is entered by
                      the NTC operator and is intended to
                      represent casualty information for
                      uninstrumented vehicles. However, the CIS
                      operators may include both instrumented and

the message is used to turn on the Unit Engagement graphic display.

UNITENGAGE- This table includes NTC statistical data from the firing and pairing tables. For each unit. the number of hits. kills and near misses are provided for each statistical weapon of interest against opposing force targets of interest. This data is used in the NTC software for calculation of the following statistcal displays: Firing Summary. Firing Summary by Weapon Type, BLUEFOR Engagements. OPFOR Engagements and Engagement Activity. These displays are defined in the NTC 500 Player RDS.

ENGRNGSUM- This table contains the cumulative weapon engagement range (i.e.. range from weapon to target for a weapon-target pairing). by weapon effect (i.e.. near miss. hit or kill) for BLUEFOR tank main guns and TOWS and OPFOR tank main guns and SAGGERS. The data contained in this table are used in the NTC software for calculation of the Engagement Range Summary and Range of Pairings statistical displays.

VPRDRENGAG- This table contains a count of the number of Viper and Dragon pairings associated with a particular unit. broken down by hits. kills and near misses. for a given target range.

PLYRLOC- This table includes all stream data messages which define the position location of a player. As a part of the Translator program. the operator can choose whether or not position location information is translated and loaded into the data base.

UNITLOC- This table contains the unit location information which is generated by the system from the player position location information provided by the RDMS system. The positon of the "center" of the tactical unit is computed every 60 seconds; however. a message will only be included in this table when the unit has moved. The calculation is based upon the position of individual instrumented and uninstrumented ground players who are included in the center of mass calculations and who are assigned to the unit. Only active ground

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uninstrumented vehicle status information into these fields. Since the entry is strictly manual (i.e., the casualty information is not updated automatically based upon casualties or initial strengths which are linked to the instrumentation system), no effort is made to enforce the type of information the operator may enter.

FIRING-   This table includes stream data messages which are created based upon weapon firing information received from the RDMS system. The firing information is used by the NTC software for pairing firings with effects, as described below in the definition of the Pairing table. In addition, firing messages are utilized in the NTC software to generate firing alerts. Since the firing data are tied to the instrumentation system, only those weapons equipped with the MILES system and possessing B-units can generate a firing message.

PAIRING-   This table defines how weapon firing events were paired with weapon effects events. This pairing information is used in the NTC software in the computation of ground player performance statistics and alert messages. Weapon-target pairing is performed using time coincidence and the firer's weapon type code. In cases where the firer's weapon type code in the firing message does not uniquely identify the weapon type which fired, the player's ID is used to obtain a predetermined weapon type associated with the particular player.

FIRPAIRING-   This table contains a count of the number of pairings, broken down into hits, kills and near misses, scored by "weapons of interest" associated with the unit.

OTHERWEAPON-   This table contains a count of the number of hits, kills, and near misses for a given set of weapons assigned to the "other" category. These are players with MILES but no B-units.

UNITENGMSG-   This table includes the information which indicates that a unit is engaged. NTC determines this information based upon player firing and casualty event data received from the RDMS subsystem and the NTC pairing algorithm. In NTC software.

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players (i.e., those that are alive and attached to the unit) for whom at least one position measurement has been processed within the last 15 minutes are included in this computaion. Selected ground players may also be excluded from the center of mass computaions for a unit although they are still assigned to the unit, based upon operator request via the Player/Unit ID interactive menu.

MIXED UNIT- This table includes all stream data messages which are created whenever more than one unit symbol type is selected for the units attached to a battalion or a company. The NTC display software utilizes this information to draw the battalion task force indicator and the company team symbol on the appropriate unit symbols. The initial mixed unit status is reflected in the mixed unit field of the Unitstatevt table.

UNITMOVEMENT- This table includes the statistical information which is used to generate the Rate of Movement - Summary statistical display and the Mean Rate of Advance Toward Objective side panel display.

COMMO- This table defines the transmission times 55seconds and over of radios associated with the player. It is based upon the key up, key down data provided by the RDMS subsystem at NTC. RDMS translates commo keying event messages each time an instrumented radio is keyed by its operator. Separate keying messages are sent when the operator depresses and when he releases the radio transmission key. These commo keying events are placed in a Commo Event Aging Buffer upon receipt. Key depression events are correlated with the corresponding key release event (for the same radio.) Key events remain in the aging buffer for a period of time equal to two RDMS polling cycles or until a key release event is paired with the key depression event, depending on which is longer.

If a second key depression event is received for a radio without an intervening key release event, the first key depression event is ignored from a statistical point of view. When a key depression event is

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paired with a key release event. the time of transmission associated with the event is computed.

UNITTRANS—   This table summarizes the radio transmissions made for a unit. A cumulative number of transmissions greater than 25 seconds but less than 55 seconds, transmissions equal to or greater than 55 seconds and the cumulative number and length of transmissions are maintained. The communication statistics contained in this table are used to generate the Radio Transmission Summary and the Radio Transmission Activity statistical reports.

CONMESVECTOR—   This table defines control measures which are defined in an exercise segment. The operator enters control measures via the Control Measure interactive menu. Tactical categories associated with each control measure are defined in the Conmestaccat table.

CMDELETE—   this table is used to indicate that a control measure has been deleted. based upon operator request.

CMLOCATION—   This table defines the location of the points which define each control measure.

CONMESTACCAT—   This table is used to identify the tactical categories associated with each control measure. Available tactical categories include: Maneuver. Fire Support. Intelligence, Mobility, CSS and Air Defense. Up to six tactical categories may be defined for a single control measure.

MINFLDCASLOG—   This table reflects data which has been entered by the CIS operator via the Minefield Event interactive menu and is displayed in the Minefield Event Summary tabular display. In combination with the Minefieldcas table. all defined minefield casualties are provided. It is important to note that minefield processing at NTC is a manual process. The software does not reccomend casualties and does not keep track of the existence of minefields.

MINEFIELDCAS—   This table lists the individual instrumented player bumper numbers who were assessed as casualties due to each

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minefield event.   Used in combination with the Minfldcaslog table.   the casualties resulting from minefield events can be determined.

IFPREPLANTAR-   This table includes the targets which have been defined by the operator for IFCAS missions. The operator defines targets for inclusion in the NTC target table via the Indirect Fire interactive menu.   A maximum of 1,000 pre-planned targets (i.e.. 500 BLUEFOR targets and 500 OPFOR targets) may be defined.

IFTARGROUP-   This table defines the groups of targets which have been defined by the operator for IFCAS missions.   The operator defines groups of targets for inclusion in the NTC target group table via the Indirect Fire interactive menu.   A maximum of 50 groups of targets may be defined.   A separate entry is included in this table for each target included in a target group.

IFCASTARGET-   This table defines IFCAS Target Engagements which occurred.   The data which define an IFCAS mission is defined by the CIS operator via the Indirect Fire interactive menu.

IFCASCASULTY-   This table. in combination with the Casualties table. defines the casualty recommendations which were provided by the NTC IFCAS software to the CIS operator. This particular table includes the information which identifies the fire mission and the recommendations for uninstrumented casualties: the Casualties table provides the casualty recommendations which are associated with instrumented players for each mission.

IFCASALERT-   This table includes all stream data messages used to generate the IFCAS alert which is displayed 30 seconds prior to a mission's scheduled execution time

FIRESUPLOG-   This table. in conjuction with the Casualties table. indicates those IFCAS mission data which are included in the Fire Support Log.   This table includes the mission definition and casualties assessed (through use of the Fire Mission Result interactive menu) for uninstrumented

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Equipstatus table, indicates the status of the five CPU's.

AARCOMMANDS- This table indicates the possible AAR commands for the 15 AAR files. AAR button setting and range fan tables (i.e., BLFORBUTTONS, OPFORBUTTONS, LFBUTTONS, ALERTBUTTONS, OTHERBUTTONS, MAPBUTTONS, and RANGEFANS) are associated with each AAR command by time and indicate exactly what the display settings were for the AAR playback. Only one AAR command file need be loaded for each history as only one set of AAR files are associated with a history and the Translator program will utilize the last AAR command file for the history, regardless of the individual segment being translated.

MAPBUTTONS- This table indicates the AAR map button name and the status or setting for each button associated with an AAR command.

BLFORBUTTONS- This table indicates the AAR BLUEFOR button name and the status or setting for each button associated with an AAR command.

ALERTBUTTONS- This table indicates the AAR alert button name and the status for each button associated with an AAR command.

OPFORBUTTONS- This table indicates the AAR OPFOR button name and the status or setting for each button associated with an AAR command.

RANGEFANS- This table indicates the player for whom a range fan will be shown for each AAR command.

LFBUTTONS- This table indicates the AAR live fire button name and the status for each button associated with an AAR command.

OTHERBUTTONS- This table indicates the AAR Other button name and the status or setting for each button associated with an AAR command.

COORDINATES- This table provides a translation between location position values and UTM coordinates.

personnel and vehicles; the Casualties table includes the casualties assessed for instrumented vehicles.

CASUALTIES-   This table defines the casualty recommendations for instrumented players which were provided by the NTC IFCAS software to the CIS operator, as well as the actual instrumented player casualties which were assessed by the field controllers and subsequently entered in the Fire Mission Result interactive menu.

LFSCENARIO-   This table indicates the status of the live fire scenario.

TGTHOLVECTOR-   This table represents the initial target status of each target on the live fire range.

LFTARGETEVNT-   This table indicates the events which occurred on the live fire range by the target system.

LFTARGETSTAT-   This table indicates the status of each target on the live fire range.

SEGSUMRATING-   This table defines the segment summary ratings which were provided by key training operations group personnel (i.e., TAFO, EMCO, and Chief OC) at the end of the segment. The collective judgement of this group for the performance of the battalion is expressed in ordinal measures from 0-9, using the following value scheme: 0 = no observation; 1 = very poor performance; 3 = poor performance; 5 = nominal expected perpormance proficiency; 7 = good performance; and 9 = excellent performance. The evaluation of a battalion can be changed at any time after the initial entry, howerver, only the final value remains in the NTC data base.

OCASSESSMENT-   This table includes the periodic assessments provided by the field controllers on unit performance. These assessments are made against a set of Elements of Information (as defined in the OCinfoelement table) which cover all aspects of combat operation (i.e., target aquisition, maneuver, fire, communication, command and control, logistics and administration). The specific set of EIs

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to be reported on for each unit selected for observer controller (OC) assessment are selected at the beginning of the exercise segment. EIs for a particular segment are selected from a group of 300 predefined categories.

OCINFOELEMENT-   This table, in conjunction with the OCassessment table, defines the unit ratings by OCs. This table contains the list of EIs used for rating the segment.

FREEFORMMSG-   This table includes all free format messages which were generated for a particular segment. Free format messages are entered through the alphanumeric terminals and are stored in the NTC data base in accordance with either an operator specified time or the exercise time as displayed on the tactical display at the time of the message entry. The issuer of the message and the tactical category of the message must be a part of each free format message. Messages which are routed to a specific station, and not to a tactical category are not entered into the NTC data base and are not, therefore, included in this table.

MSGCATEGORY-   This table includes the categories associated with the free format messages in the Freeformmsg table.

TRACKINGSTAT-   This table includes all stream data messages which are generated to indicate when the CIS has lost or restored the receipt of position location data on an instrumented player. If a particular player has not sent updates on his position location for 15 minutes, the NTC software indicates that position location data have been lost for that player. The messages contained in this table indicate when the data are lost and when they have been restored.

EQUIPSTATUS-   This table, in conjunction with the CPUstatus table, indicates when a major component of the RDMS system fails. The data is used by the NTC software in the generation of the System Status alert message.

CPUSTATUS-   This table, in conjunction with the

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Analysis of the Table Content

As is apparent from the above descriptions the sixty-one tables serve different functions and provide different aspects of the particular history segment. Further, the data in the tables are derived from different sources with varying levels of reliability. In order to fully understand the utility of the Ingres tables for research, they were reviewed with respect to the origin of their data, the level(unit,player) of data, their function, and their substantive content. The result of this process is prsented below.

Origin of Table Data

A review of the table descriptions and the individual data elements was conducted in order to determine whether the data were manually entered, computer generated or a combination of both for each table. The results of this process indicated that 31 of the 61 tables consisted of data elements which were manually entered. Another 28 tables consisted of data which were computer generated. Finally, two tables were found to contain some elements which were computer generated and some which were manually entered. A complete list of the Ingres tables by source of data is provided below.

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Manual	Computer	Both
SEGMENTDATA	PLYREDIT	PLSTATVECTOR
SEGHEADER	PLYRCHANGE	UNITSTATCUT
MISSION	PLYRLOC	MSGCATEGORY
SEGSUMRATING	UNITEDIT	
PLYRINSTSTAT	UNITLOC	
PLYRREDESIG	UNITENGMSG	
UNITREDESIGN	UNITENGAGE	
MIXED UNIT	IFCASUALTY	
IFCASTARGET	CASUALTIES	
FIRESUPLOG	IFCASALERT	
IFPREPLANTAR	FIRING	
IFTARGROUP	PAIRING	
CONMESVECTOR	COMMO	
CMDELETE	EQUIPSTATUS	
CMLOCATION	CPUSTATUS	
CONMESTACCAT	TRACKINGSTAT	
UNVEHSTATUS	LFSCENARIO	
PERCASLTYSUM	LFTARGETEVNT	
MINFLDCASLOG	LFTARGETSTAT	
MINEFIELDCAS	TGTHOLVECTOR	
FREEFORMMSG	UNITMOVEMENT	
OCASSESSMENT	UNITTRANS	
OCINFOELEMENT	ENGMSGS	
AARCOMMANDS	FIRPAIRING	
MAPBUTTONS	VPRDRENGY	
BLFORBUTTONS	OTHERWEAPON	
ALERTBUTTONS	COORDINATES	
OPFORBUTTONS		
RANGEFANS		
LFBUTTONS		
OTHERBUTTONS		

The importance of the origin of the data elements from a research perspective revolves around issues of reliability and consistency. Specifically, data elements which are manually entered by personnel of the NTC TAF are subject to errors of accuracy and, as our analysis has shown, errors of omission. That is, many of the tables which contain manual entered data have been found to be empty or very sparse. Thus, analysis of this information would be faced with a severe missing data problem, particularly as the pattern of missing data is not random.

Level of Table Data

Another dimension along which the tables vary which is relevant from a research perspective is the level at which the data are collected or are applicable. Specifically, the tables were reviewed to determine whether the information which they contained was applicable to an individual player, or to a unit, or to the entire segment. A breakdown of the individual Ingres tables by the level of data is presented below:

Player Level Tables: PLYREDIT, PLSTATVECTOR, PLYRCHANGE, PLYRINSTSTAT, PLYRREDESIG, PLYRLOC, FIRING, PAIRING, FIRPAIRING, OTHERWEAPON, COMMO, MINEFIELDCAS, LFCASCASULTY, FIRESUPLOG, CASUALTIES

Unit Level Tables: UNITEDIT, UNITSTATVECTOR, UNITREDESIG, UNITLOC, UNITMOVEMENT, MIXED UNIT, UNITENGMSG, UNITENGAG, ENGRNGSUM, VPRDRGENGAG, PERCASLTYSUM, UNITTRANS, MINFLDCASLOG

Segment Level Tables: SEGMENTDATA, SEGHEADER, MISSIONS, UNVEHSTATUS, CONMESVECTOR, CMDELETE, CMLOCATION, CONMESTACCAT, COORDINATES, LFSCENARIO, TGTHOLVECTOR, LFTARGETEVNT, LFTARGETSTAT, SEGSUMRATING, OCASSESSMENT, OCINFOELEMENT, TRACKINGSTAT, EQUIPSTATUS, CPUSTATUS, AARCOMMANDS, MAPBUTTONS, BLFORBUTTONS, ALERTBUTTONS, OPFORBUTTONS, RANGEFANS, LFBUTTONS, OTHERBUTTONS, IFPREPLANTAR, IFTARGROUP, IFCASTARGET, IFCASALERT

Function of Ingres Tables

An analysis of the 61 Ingres tables was performed with respect to their completeness and specific function. That is, the analysis addressed two questions: Is the table empty or does it contain data and does the table contain operational information or performance information?

The results of the analysis showed that 12 tables were empty for every segment currently translated and loaded at ARI-POM. These tables generally were concerned with live-fire performance or various edit information (a list of these is provided below).

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The analysis of the tables which had data for at least one
segment. showed that four identifiable categories existed:
operational tables. update or edit tables. derived tables, and
performance tables. The operational tables contain information
which is a record of specific aspects of the operations existing
during the exercise recorded on the segment. They typically are
concerned with things like the settings on the De Anza tablet. cpu
status. tracking status.etc. At best the information in these
tables might provide relevant contextual or background information
for conduct of analysis. The update tables record the actions of
members of the TAF during an exercise which in some way change the
status of a player or unit. Many of these tables are sparse and
the information in them reflects changes in symbology or in
variables not directly related to performance. The derived tables
are tables composed of information taken from other tables. These
tables are usually aggregates of tables from lower echelons. The
performance tables contain information which is unique and which
would be usefully included in a digital data base from which
statistical analyses might be performed. A list of the tables in
each of the four categories follows below:

Operational tables

AARCOMMANDS
MAPBUTTONS
BLFORBUTTONS
ALERTBUTTONS
OPFORBUTTONS
RANGEFANS
LFBUTTONS
OTHERBUTTONS
COORDINATES
CPUSTATUS
UNVEHSTATUS
TRACKINGSTAT
SEGMENTDATA
UNITENGMSG
MIXED UNIT
UNITMOVEMENT

Update Tables

PLYREDIT
PLYRCHANGE
PLYRINSTSTAT
PLYRREDESIG
UNITEDIT
UNITREDESIGN

Useable Tables

PLYRSTATVECTOR
UNITSTATEVNT
PERCASLTYSUM
FIRING
PAIRING
OTHERWEAPON
ENGRNGSUM
UPRDRENGAG
PLYRLOC
UNITLOC
CMMO
MINEFIELDCAS

Derived Tables

FIRPAIRING
UNITENGAG
UNITTRANS

Substantive Review of Ingres Tables

In addition to the reviews cited above, the data elements and corresponding tables were investiagted with respect to their potential substantive use. That is, they were analyzed to determine the measurement area to which they would be appropriate in the conduct of statistical anaylses. The review consisted of two parts. The initial effort focused on identifying and catgeorizing the individual tables in terms of conceptual measurement areas. The second part of the effort focused on an analysis of the individual data elements in terms of their occurrence across tables, type of information, and format. The results of these efforts are described below.

Analysis of the 61 tables indicated that they could be grouped into 13 distinct categories. These categories range in terms of their applicability for statistical research, level of information and type of information. The categories and the Ingres tables which comprise them follows:

I Seg Start Info: SEGMENTDATA, SEGHEADER, MISSION, UNVEHSTATUS

II Player Info: PLYREDIT, PLSTATVECTOR, PLYRCHANGE, PLYRINSTSTAT,
PLYRREDESIG, PLYRLOC

III Unit Info: UNITEDIT, UNITSTATEVT, UNITREDESIG, PERCASLTYSUM,
UNITMOVEMENT, MIXED UNIT

IV Firing Info: FIRING, PAIRING, FIRPAIRING, OTHERWEAPON

V Unit Engagement Info: UNITENGMSG, UNITENGAGE, ENGRNGSUM,
VPRDRENGAG

VI Communications: COMMO, UNITTRANS

VII Control Measures: CONMESVECTOR, CMDELETE, CMLOCATION,
CONMESIACCAT

VIII Minefields/Fire Support: MINFLDCASLOG, MINEFIELDCAS,
           IFPREPLANTAR,IFTARGROUP, IFCASTARGET, IFCASCASULTY,
           IFCASALERT, FIRESUPLOG, CASUALTIES

IX Live Fire: LFSCENARIO, TGTHOLVECTOR, LFTARGETEVNT,
           LFTARGETSTAT

X Segment Summaries: SEGSUMRATING, OCASSESSMENT, OCINFOELEMENT

XI Status Info: TRACKINGSTAT, EQUIPSTATUS, CPUSTATUS

XII AAR's: AARCOMMANDS, MAPBUTTONS, BLFORBUTTONS, ALERTBUTTONS,
           OPFORBUTTONS, RANGEFANS, LFBUTTONS, OTHERBUTTONS

XIII Messages: FREEFORMMSG, MSGCATEGORY

Investigation of the individual data elements was concerned
primarily with identifying the number of unique data elements
across   the   61   tables.   Secondarily it was concerned with
establishing the format of the element. its informational type
(eg.numeric, date, character, etc) and table occurrence. Results
of this examination showed that there were a total of no more than
223 data elements across all 61 tables. This includes 41 different
time variables. A list of the specific elements, their variable
length, variable type and initial table occurrence is presented
below.   It should be noted that the same variable name is often
used to reference variables which in fact measure different
things. e.g. status, weapon, and event-type. A breakdown of the
variables by Ingres table is presented in the Appendix.

Summary

The results of the review of the Ingres tables and their data
elements indicates that their utility is limited, there is
considerable redundancy across tables. Further, much of the
information is only marginally useful to a research understanding
of NTC performance. Finally, there is a demonstrated problem in

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data tables being empty and in data elements being of suspect
reliability and accuracy.